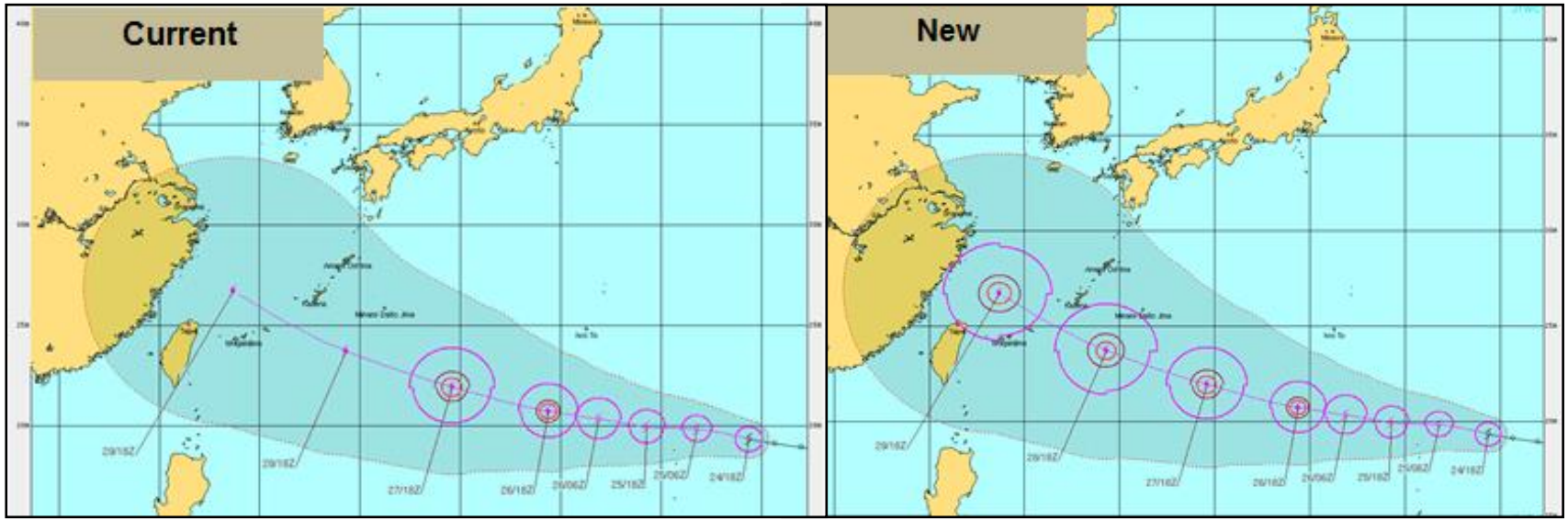
At 0000Z Nov 1, 2016, JTWC will implement improvements to its wind radii analysis and forecast products. These changes will also improve the the accuracy of the 34 knot danger swath.

Recent data re-analysis and research efforts led by the Naval Research Laboratory (NRL) Monterey, in collaboration with CIRA and JTWC, have yielded cutting-edge techniques to skillfully analyze, forecast, and verify tropical cyclone surface wind distribution through a five day forecast period. Enhancements to the Automated Tropical Cyclone Forecast System (ATCF) have enabled operationalization of these improvements. **There are four changes to wind radii analyses and forecasts products, which will be reflected in JTWC warning graphics, warning text messages, warning summary, and TCW files (click to view sample products)**. A full description of each change is provided below, followed by a conceptual model of JTWC wind radii estimation and terminology.

1) Wind radii forecasts will be extended from three days to five days (120 hours)

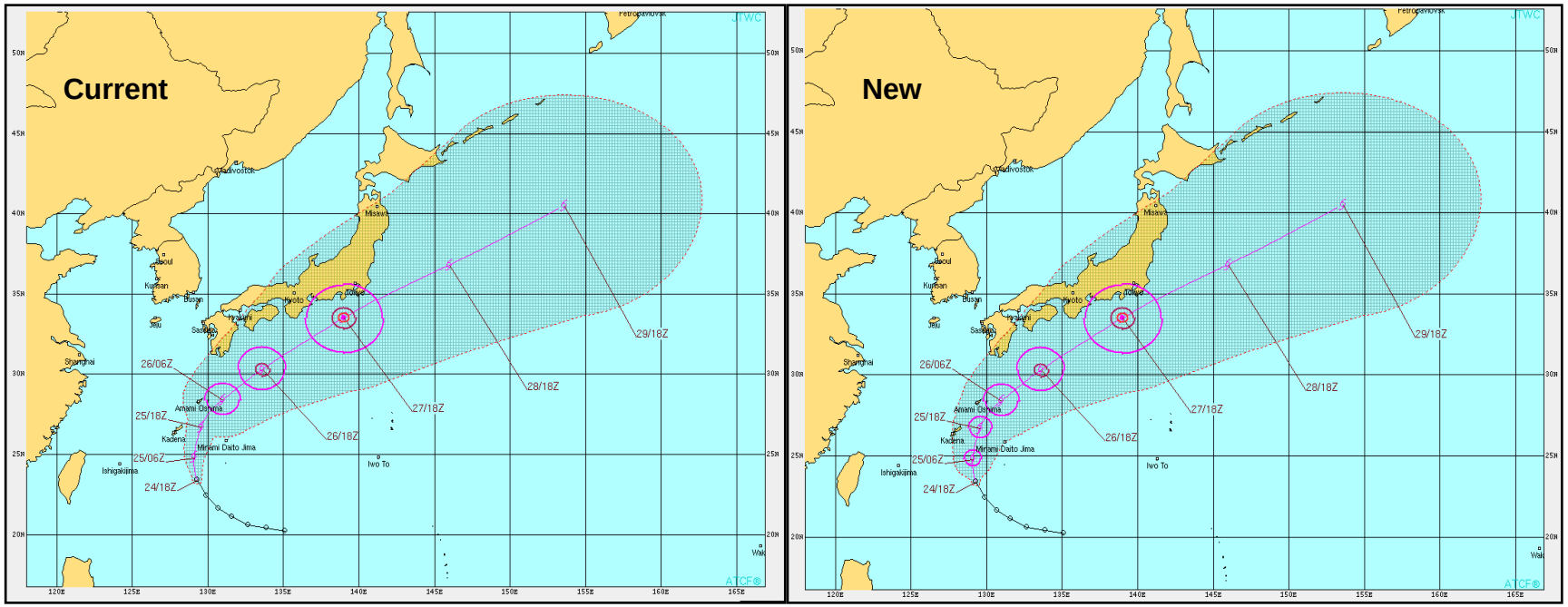
Recent studies (manuscripts in process) indicate that the new NRL-MRY wind radii consensus (RVCN), based on a consensus of numerical model guidance, significantly improves wind radii forecast skill at all forecast lead times. In fact, the five-day wind radii forecast skill of these new methods is nearly equivalent to the current JTWC three-day wind radii forecast skill. The addition of skillful wind radii forecasts at days 4 and 5 are intended to provide more useful guidance for advance storm impact planning to decision makers.

Impact to JTWC 34 knot danger swath: Previously, the size of the swath at days 4 and 5 was based on the 72-hour forecast wind radii, plus the 5-year running mean forecast track error at days 4 and 5, respectively. The swath radius at days 4 and 5 will now use the explicit day 4 and 5 wind radii forecast values in the calculation.



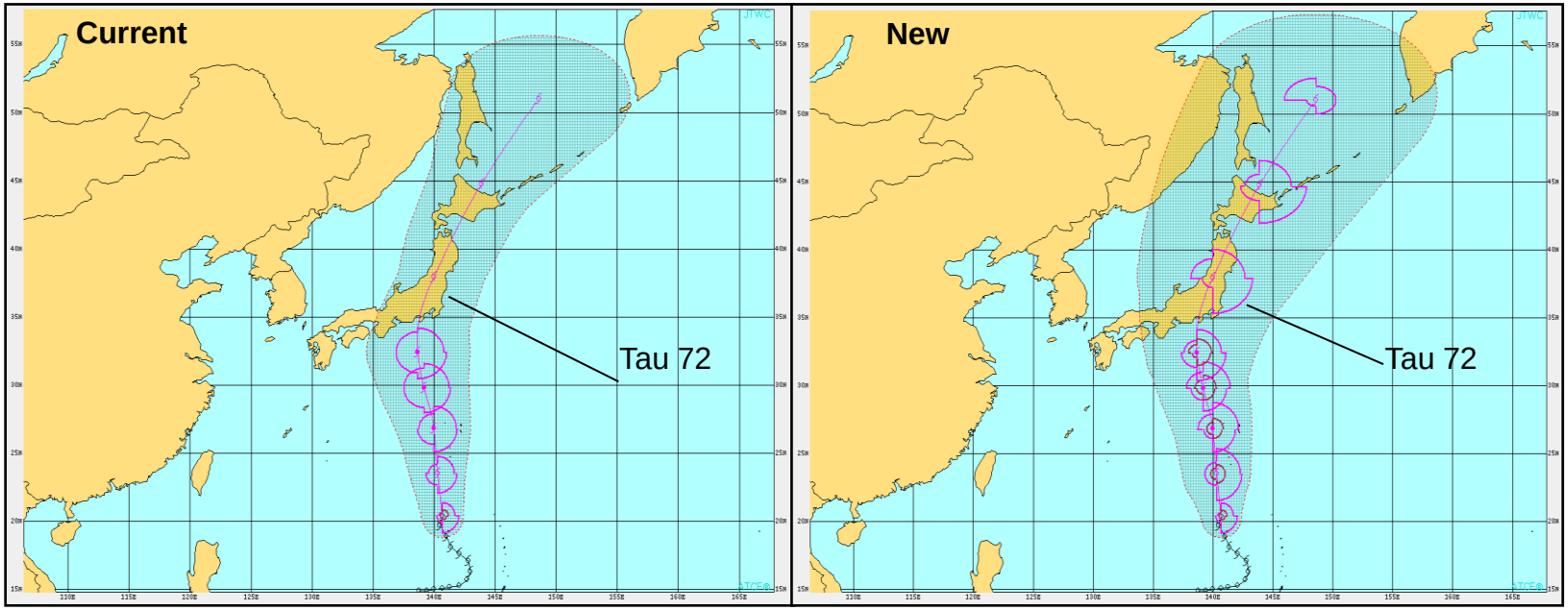
2) Wind radii analyses and forecasts that correspond to threshold intensity forecast values will be included in warning text and graphical products (i.e., 34-knot radii for 35-knot cyclones, 50-knot radii for 50-knot cyclones, and 64-knot radii for 65-knot cyclones)

Including "threshold value" wind radii will provide a more detailed depiction of cyclone structure as soon as a threshold value is reached. Previously, wind radii values were not included until tropical cyclone intensities were 5 knots over the threshold values. The new procedure to include threshold value wind radii is consistent with current National Hurricane Center and Central Pacific Hurricane Center practices. **Impact to JTWC 34 knot danger swath:** Previously, forecast positions with an intensity of 35 knots would not include wind radii values, so swath width was determined solely as the 5-year running mean track error for the respective forecast time. Now that wind radii values are specified for 35 knot tropical cyclones, the swath width calculation will include both the 35 knot wind radii plus the 5-yr error components.



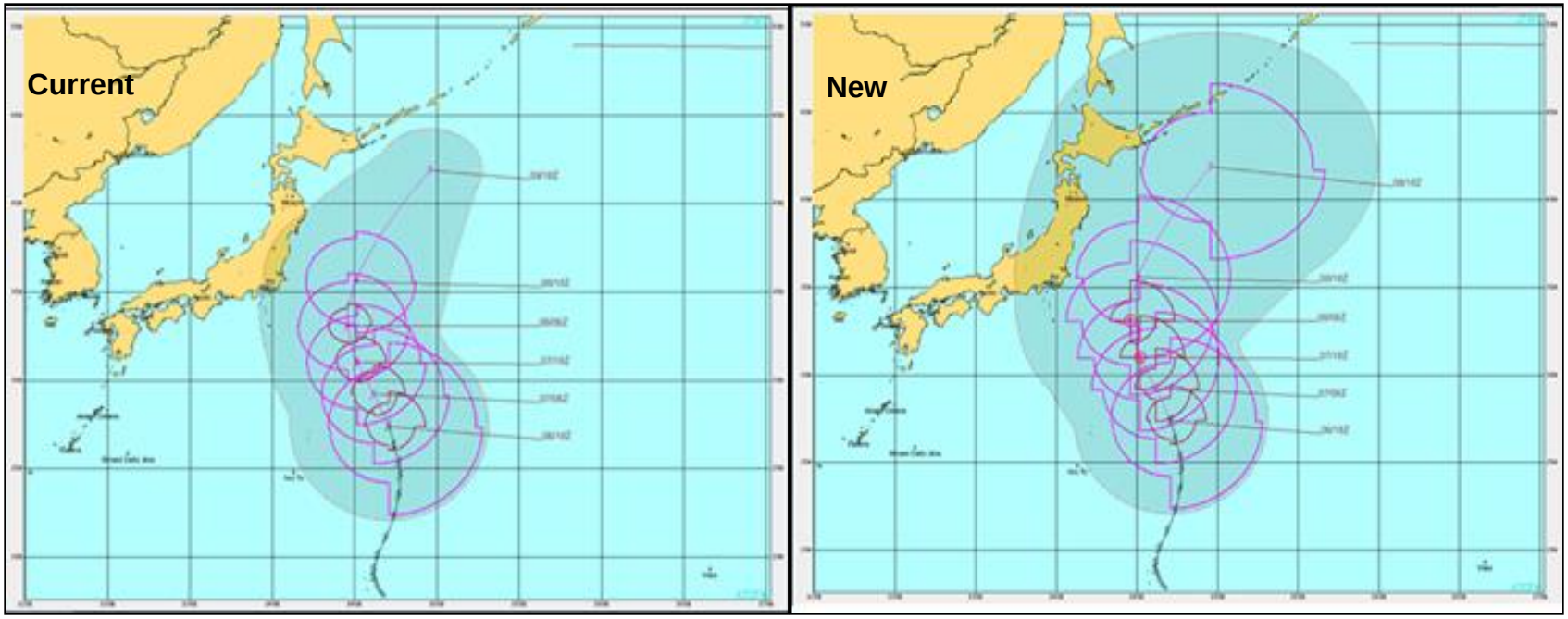
3) Wind radii forecasts will be included with over-land positions whenever any portion of the forecast wind radii extends over water. <u>JTWC forecast wind radii remain valid only over water.</u>

Currently, JTWC forecasts do not include wind radii for forecast (circulation center) positions that are situated over land. JTWC will now include forecast wind radii for inland positions whenever any portion of the forecast wind radii extends over water. The new process will provide previously-unavailable wind forecast information for off-shore locations and potentially improve guidance from wave models that incorporate JTWC wind radii forecast data. **<u>Impact to JTWC 34 knot danger swath:</u>** Currently, the absence of forecast wind radii values over land can lead to an unrealistic shrinking of the swath. The new JTWC wind radii accounts for land effects via the RVCN, and will preserve the swath shape and size when warranted.



4) Wind radii forecasts will be included with extratropical and subtropical positions.

Currently, JTWC forecasts do not include wind radii for forecast times during which storm state is classified as extratropical or subtropical (typically the final forecast posit of a tropical cyclone that has re-curved). During phase transitions, tropical cyclone wind fields typically expand, posing a continued risk of high winds and seas even as systems are weakening. JTWC will now include forecast wind radii for these posits. Statistical analyses have demonstrated that the new numerical model consensus accurately accounts for changes to tropical cyclone wind field structure associated with extratropical or subtropical transition. **Impact to JTWC 34 knot danger swath:** Previously, the swath size calculation for days 4 and 5 relied on tau 72 wind radii values, resulting in a potentially significant under-estimate of the wind field during the transition process. This was particularly problematic when there were no tau 72 wind radii (e.g., the intensity was 35 knots, or the center was over land). Because the new consensus methodology accounts for phase transitions, and days 4 and 5 wind radii values are explicitly used in the calculation, the swath size will be more accurate.



A conceptual model of JTWC wind radii estimation and terminology: